Automatic rail-weighbridges

Part 2: Test report format

International Organisation of Legal Metrology (OIML)

First committee draft Recommendation OIML R 106-2

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EXPLANATORY NOTE

OIML TC9/SC2 "Automatic Weighing instruments"
Secretariat: United Kingdom

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FOREWORD

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States.

The two main categories of OIML publications are:

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INTRODUCTION

This "test report format" aims at presenting, in a standardized format, the results of the various tests and examinations to which a type of an automatic instrument for weighing road vehicles in motion (total vehicle weight) shall be submitted with a view to its approval.

The test report format consists of two parts, a "checklist" and the "test report" itself.

The checklist is a summary of the examinations carried out on the instrument. It includes the conclusions of the results of the test performed, experimental or visual checks based on the requirements of Part 1. The words or condensed sentences aim at reminding the examiner of the requirements in R 106-1 without reproducing them.

The test report is a record of the results of the tests carried out on the instrument. The "test report" forms have been produced based on the tests detailed in R 106-1.

All metrology services or laboratories evaluating types of automatic instruments for weighing rail wagons in motion (wagon mass) accordingly to R 106-1 or to national or regional regulations based on this OIML Recommendation are strongly advised to use this test report format, directly or after translation into a language other than English or French. Its direct use in English or in French, or in both languages, is even more strongly recommended whenever test results may be transmitted by the country performing these tests to the approving authorities of another country, under bi- or multilateral cooperation agreements. In the framework of the *OIML Certificate System for measuring instruments*, use of this test report format is mandatory.

The "information concerning the test equipment used for type evaluation" shall cover all test equipment which has been used in determining the test results given in a report. The information may be a short list containing only essential data (name, type, reference number for purpose of traceability). For example:

-       Verification standards (accuracy, or accuracy class, and No.)
-       Simulator for testing of modules (name, type, traceability and No.)
-       Climatic test and static temperature chamber (name, type and No.)
-       Electrical tests, bursts (name of the instrument, type and No.)
-       Description of the procedure of field calibration for the test of immunity to radiated electromagnetic fields

Note concerning the numbering of the following pages

In addition to a sequential numbering: "R 106-2 page ..." at the bottom of the pages of this publication, a special place is left at the top of each page (starting with the following page) for numbering the pages of reports established following this model; in particular, some tests (e.g. metrological performance tests) shall be repeated several times, each test being reported individually on a separate page following the relevant format; in the same way, a multiple range instrument shall be tested separately for each range and a separate form (including the general information form) shall be filled out for each range. For a given report, it is advisable to complete the sequential numbering of each page by the indication of the total number of pages of the report.

AUTOMATIC RAIL-WEIGHBRIDGES

TYPE EVALUATION REPORT

EXPLANATORY NOTES

ABBREVIATIONS AND SYMBOLS

Symbols	Meaning
I	Indication
I_n	n^{th} indication
L	Load
ΔL	Additional load to next changeover point
P	$I + 1/2\ e - \Delta L$ = Indication prior to rounding (digital indication)
E	$I - L$ or $P - L$ = Error
$E\%$	$(P - L)/L$ %
E_0	Error at zero load
d	Actual scale interval
p_i	Fraction of the MPE applicable to a module of the instrument which is examined separately.
MPE	Maximum permissible error
EUT	Equipment under test
sf	Significant fault
Max	Maximum capacity of the weighing instrument
Min	Minimum capacity of the weighing instrument
U_{nom}	Nominal voltage value marked on the instrument
U_{max}	Highest value of a voltage range marked on the instrument
U_{min}	Lowest value of a voltage range marked on the instrument
v_{min}	Minimum operating speed
v_{max}	Maximum operating speed
DC	direct current
Rel. h.	Relative humidity
Temp	Temperature
AC	alternating current

The name(s) or symbol(s) of the unit(s) used to express test results shall be specified in each form.

For each test, the "SUMMARY OF TYPE EVALUATION" and the "CHECKLIST" shall be completed according to this example:

	P	F
			P = Passed, F = Failed
when the instrument has passed the test:	X	
when the instrument has failed the test:		X
when the test is not applicable:	/	/

The white spaces in boxes in the headings of the report should always be filled according to the following example:

	At start	At end	
Temp:	20.5	21.1	°C
Rel. h:			%
Date:	2006:01:29	2006:01:30	yyyy:mm:dd
Time:	16:00:05	16:30:25	hh:mm:ss

"Date" in the test reports refers to the date that the test was performed.

In the disturbance tests, faults greater than d are acceptable provided that they are detected and acted upon, or that they result from circumstances such that these faults shall not be considered as significant; an appropriate explanation shall be given in the column "Yes (remarks)".

Section numbers in brackets refer to the corresponding subclauses of R 106-1.

GENERAL INFORMATION CONCERNING THE TYPE

Application No: .... Manufacturer: ....

Type designation: _____..................................... Applicant: ....

Instrument category: ....

| | Full draught weighbridge | | Partial weighbridge |
Testing on:

| | Complete instrument | | Module[1] |

Accuracy class: | | 0.2 | | 0.5 | | 1 | | 2

Maximum capacity = | | Maximum wagon weight = | | v_{man} = | |

Minimum capacity = | | Minimum wagon weight = | | v_{min} = | |

T = + | | T = - | | d = | |

Power supply:

$U_{nom}{}^2$ = | | V U_{min} = | | V U_{max} = | | V f = | | Hz Battery, U = | | V

| | Semi-automatic

| | Automatic zero-setting

Zero-setting device: | | Initial zero-setting

| | Zero-tracking

Initial zero-setting range | | % Temperature range | | °C

Printer: | | Built in | | Connected | | Not present but connectable | | No Connection

---

[1] The test equipment (simulator or part of a complete instrument) connected to the module shall be defined in the test form(s) used.

[2] Voltage U_{nom} is the nominal voltage marked on the instrument.

GENERAL INFORMATION CONCERNING THE TYPE (continued)

Instrument submitted: .... Connected equipment: ....

Identification No: .... Interfaces (numbers, nature): ....

Load sensor: _____.................................

Manufacturer: _____.................................

OIML R 60 certificate of conformity:

YES	
NO	

Certificate number

Type: .... Capacity: ....

Number: .... _____Classification symbol:..................................

Date of report:..................................

Evaluation period: ....

Observer:..................................

Use this space to indicate additional remarks and/or information: other connected equipment, interfaces and load cells, choice of the manufacturer regarding protection against disturbances, etc.

IDENTIFICATION OF THE INSTRUMENT

Application No: ....   Type designation: ....

Report date: ....   Manufacturer: ....

Serial No: ....

Manufacturing Documentation

(Record as necessary to identify the equipment under test)

System or module name	Drawing number or software reference	Issue level	Serial No.
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....

Simulator documentation

System or module name	Drawing number or software reference	Issue level	Serial No.
....	....	....	....
....	....	....	....
....	....	....	....

Simulator function (summary)

(Simulator description and drawings, block diagram etc should be attached to the report if available.)

IDENTIFICATION OF THE INSTRUMENT (continued)

Application No: .... Type designation: ....

Report date: .... Manufacturer: ....

Description or other information pertaining to identification of the instrument:
(*attach photograph here if available*)

INFORMATION CONCERNING THE TEST EQUIPMENT USED FOR TYPE EVALUATION

TEST EQUIPMENT

List all test equipment used in this report (including descriptions of the reference vehicles used for testing)

Equipment name	Manufacturer	Type No	Serial No	Used for (test references)
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....

CONFIGURATION FOR TEST

Application No:	.... Type designation:	....

Report date:	.... Manufacturer:	....

Use this space for additional information relating to equipment configuration, interfaces, data rates, load cells EMC protection options etc. for the instrument and/or simulator.

SUMMARY OF TYPE EVALUATION

Application No: __   ....

Type designation: .   ...

	TESTS	Report page	Passed	Failed	Remarks
1	**Zero-setting**				
2	**Warm-up time**				
3	**Influence factors**				
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3.2	Temperature effect on no load indication				
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6.1	Non-automatic tests of the control instrument:				
6.1.2	Accuracy of zero-setting				
6.1.3	Determination of weighing performance				
6.1.4	Eccentricity				
6.1.5	Discrimination				
6.2	**Full-draught weighing of reference wagons – uncoupled, coupled or train**				
6.3	**Partial weighing of reference wagons**				
7	**Examination of the construction**				
8	**Checklist**				

SUMMARY OF TYPE EVALUATION (continued)

Use this page to detail remarks from the summary of the type evaluation.

1   ZERO-SETTING (3.3, A.5.1)

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss

Scale interval d: ....

Resolution during test:
(smaller than d):   ....

1.1   Range of zero-setting (3.3.2, A.5.1.1)

Zero-setting mode	Positive zero limit load L_1	Negative zero limit load L_2	Range $L_1 + L_2$	% of maximum load

☐ Passed   ☐ Failed

Remarks:

1.2   Accuracy of zero-setting (3.3.1, A.5.1.2)

Zero-setting mode	ΔL	$E = ½ d - \Delta L$	MPE

☐ Passed   ☐ Failed

Remarks:

2   WARM-UP TIME (4.3.4, A.6.1)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test:
(smaller than d):   ....

Duration of disconnection before test: ....   hrs

Automatic zero-setting and zero-tracking device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation[3]

$E = I + \frac{1}{2} d - \Delta L - L$

E_0 = error calculated prior to each measurement at zero or near zero (unloaded)

E_L = error calculated at load (loaded)

	time (*)	Load L	Indication I	Add load ΔL	Error	$E_L - E_0$
Unloaded	0 min				$E_{0I} =$	
Loaded					$E_L =$	
Unloaded	5 min				$E_0 =$	
Loaded					$E_L =$	
Unloaded	15 min				$E_0 =$	
Loaded					$E_L =$	
Unloaded	30 min				$E_0 =$	
Loaded					$E_L =$	

(*)   Counted from the moment an indication has first appeared.

Error[4]			MPE	
Initial zero-setting error	E_{0I}	$\leq 0.25\ d$	=	
Maximum value of error unloaded	E_0	$\leq 0.5\ d$	=	
Maximum value of zero variation	$E_0 - E_{0I}$	$\leq 0.25\ d * Pi$	=	
Maximum value of error loaded	$E_L - E_0$	$\leq 0.25\ d * Pi$	=	

☐ Passed   ☐ Failed

Remarks:

---

[3] In operation only if zero operates as part of every automatic weighing cycle

[4] Check that the error is $\leq$ the MPE

3 ____INFLUENCE FACTORS

3.1 ____Static temperatures (2.7.1.1, A.7.2.1)

3.1.1 ____Reference temperature of 20 ºC

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + \frac{1}{2} d - \Delta L - L$

$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed ☐ Failed

Remarks:

3.1.2 _____ **Static temperatures (specified high)**

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: (smaller than d) ....

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + ½ d - ΔL - L$
$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed ☐ Failed

Remarks:

3.1.3 _____Static temperatures (specified low)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation

$E = I + ½ d - \Delta L - L$

$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

3.1.4 _____Static temperatures (5⁰C if within the specified range)

		At start	At end	
Application No:	....			°C (Temp:)
Type designation:	....			% (Rel. h:)
Observer:	....			yyyy:mm:dd (Date:)
				hh:mm:ss (Time:)

Application No: ....

Type designation: ....

Observer: ....

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation

$E = I + \frac{1}{2} d - \Delta L - L$

$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

3.1.5 _____ **Static temperatures (Reference temperature of 20⁰C)**

	At start	At end	

Application No: ....   Temp: [shaded] [shaded] °C

Type designation: ....   Rel. h: %

Observer: ....   Date: yyyy:mm:dd

Time: hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation

$E = I + \frac{1}{2} d - \Delta L - L$

$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

3.2 Temperature effect on no-load indication (2.7.1.2, A.7.2.2)

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: (smaller than d): ....

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$P = I + ½ d - \Delta L$

Report Page[5]	Date	Time	Temp (°C)	Zero indication I	Add load ΔL	P	ΔP	ΔTemp	Zero-change per 5 °C

ΔP = difference of P for two consecutive tests at different temperatures
ΔTemp = difference of temperature for two consecutive tests at different temperatures

Check if the zero-change per 5 °C is smaller than d

☐ Passed ☐ Failed

Remarks:

---

[5] Give the report page of the relevant weighing test where weighing tests and temperature effect on no-load indication test are conducted together.

3.3 Damp heat tests, steady state (4.3.3, A.7.2.3)

3.3.1 Reference temperature of 20 °C and 50 % humidity

		At start	After 3 h	At end	
Application No:	....	Temp:			°C
Type designation:	....	Rel. h:			%
Observer:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d):

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

$E = I + \frac{1}{2} e - \Delta L - L$
$E_c = E - E_0$ with E_0 = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	↑
(*)					(*)				

☐ Passed ☐ Failed

Remarks:

3.3 _____Damp heat, steady state tests (continued)

3.3.2 _____Upper limit temperature (_____ °C) and 85 % humidity

		At start	After 3 h	At end	
Application No:	....	Temp:				°C
Type designation:	....	Rel. h:				%
Observer:	....	Date:				yyyy:mm:dd
		Time:				hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d):

$E = I + \frac{1}{2} e - \Delta L - L$
$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

3.3 Damp heat, steady state tests (continued)

3.3.3 Reference temperature of 20 °C and 50 % humidity

	At start	After 3 h	At end	
Temp:				°C
Rel. h:				%
Date:				yyyy:mm:dd
Time:				hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d):

$E = I + \frac{1}{2} e - \Delta L - L$

$E_c = E - E_0$ with E_0 = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

3.4 _____ AC mains **power** (2.7.2 **and** A.7.2.4)

	At start	At end	
Application No:	....	Temp:			°C
Type designation:	....	Rel. h:			%
Observer:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d):

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation

$E = I + \frac{1}{2} d - \Delta L - L$
$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Voltage conditions [6]	Load L	Indication I	Add load ΔL	Error E	Corrected error E_c	MPE
U_{nom}				(*)		
1.10 x U_{nom} or 1.10 x U_{max}						
0.85 x U_{nom} or 0.85 x U_{min}						
U_{nom}						

☐ Passed   ☐ Failed

Remarks:

---

[6] In the case of three-phase mains power, the voltage variations shall apply for each phase successively.

3.5 _____ DC mains power (2.7.2 and A.7.2.5)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Marked nominal voltage (U_{nom}) or voltage range: ☐ V

$E = I + ½ d - \Delta L - L$
$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Voltage conditions[7]	Load L	Indication I	Add load ΔL	Error E	Corrected error E_c	MPE
U_{nom}				(*)		
1.20 x U_{nom} or 1.20 x U_{max}						
minimum operating voltage (see 2.7.2)						
U_{nom}						

☐ Passed ☐ Failed

Remarks:

---

[7] Sufficient voltage to achieve instrument stability.

3.6 Rechargeable auxiliary batteries (re)chargeable during the operation of the instrument (2.7.2 and A.7.2.6)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting device is:

☐ Non-existent ☐ Not in operation ☐ Out of working range ☐ In operation

Marked nominal voltage (U_{nom}) or voltage range: ☐ V

$E = I + \frac{1}{2} d - \Delta L - L$
$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Voltage conditions[8]	Load L	Indication I	Add load ΔL	Error E	Corrected error E_c	MPE
U_{nom}					(*)	
1.20 x U_{nom} or 1.20 x U_{max}						
minimum operating voltage (see 2.7.2)						
U_{nom}						

☐ Passed ☐ Failed

Remarks:

---

[8] Rechargeable auxiliary batteries shall comply with the requirements for AC mains powered instrument with the mains power switched on.

4 ____DISTURBANCES (4.1.2, A.7.3)

4.1   AC mains voltage short time power reduction (A.7.3.1)

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss
Scale interval d:	....			

Marked nominal voltage (U_{nom}) or voltage range: ▢ V

Load	Disturbance				Result		
	Amplitude % of U_{nom}	Duration cycles	Number of disturbances	Repetition interval (s)	Indication I	Significant fault (>1 e)	
						No	Yes (remarks)
	without disturbance						
	0	0.5	10				
	0	1	10				
	40	10	10				
	70	25/30[(2)]	10				
	80	250/300[(2)]	10				
	0	250/300[(2)]	10				

(2) These values are for 50 Hz /60 Hz respectively

▢ Passed   ▢ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.2 **Electrical fast transients/burst immunity on the mains supply lines and on the I/O circuits and communication lines (A.7.3.2)**

4.2.1 **Mains supply lines**

			At start	At end	
Application No:	....	Temp:			°C
Type designation:	....	Rel. h:			%
Observer:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss
Scale interval d:	....				

Power supply lines: test voltage 1 Kv (peak), duration of the test > 1 minute at each polarity

Disturbance, Connection and Polarity		Test		Result	
		Load	Indication I	Significant fault (> d)	
				No	Yes (remarks)
without disturbance					
Live ↓ ground	pos				
	neg				
without disturbance					
Neutral ↓ ground	pos				
	neg				
without disturbance					
Protective earth ↓ ground	pos				
	neg				

☐ Passed   ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.2   Electrical fast transients/burst immunity on the mains supply lines and on the I/O circuits and communication lines (continued)

4.2.2   I/O circuits and communication lines

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss
Scale interval d:	....			

I/O signals, data and control lines: test voltage 0.5 kV, duration of the test > 1 minute at each amplitude and polarity

Load	Cable/Interface	Polarity	Result		
			Indication I	Significant fault (> d)	
				No	Yes (remarks)
without disturbance					
		pos			
		neg			
without disturbance					
		pos			
		neg			
without disturbance					
		pos			
		neg			
without disturbance					
		pos			
		neg			
without disturbance					
		pos			
		neg			
without disturbance					
		pos			
		neg			

Explain or make a sketch indicating where the clamp is located on the cable; use an additional page.

[ ] Passed   [ ] Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.3 Electrical surges on mains supply lines and on I/O circuits and communication (signal) lines (A.7.3.3)

4.3.1 Mains supply lines

Power supply lines: test voltage 0.5 kV (line to line) and 1.0 kV (line to earth), duration of test > 1 minute at each amplitude and polarity

Disturbance, Connection and Polarity		Test		Result	
				Significant fault (> d)	
		Load	Indication I	No	Yes (remarks)
without disturbance					
Live ↓ ground	pos				
	neg				
without disturbance					
Neutral ↓ ground	pos				
	neg				
without disturbance					
Protective earth ↓ ground	pos				
	neg				

☐ Passed   ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.3   Electrical surges on mains power lines and on I/O circuits and communication lines (continued)

4.3.2   I/O circuits and communication lines

	At start	At end	
Application No:	....	Temp:			°C
Type designation:	....	Rel. h:			%
Observer:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss

Scale interval d: ....

I/O signals, data and control lines: test voltage 0.5 kV (line to line) and 1.0 kV (line to earth), duration of test > 1 minute at each amplitude and polarity

Load	Lines/Interface	Polarity	Result		
			Indication I	Significant fault (>1 d)	
				No	Yes (remarks)
	without disturbance				
		pos			
		neg			
	without disturbance				
		pos			
		neg			
	without disturbance				
		pos			
		neg			
	without disturbance				
		pos			
		neg			
	without disturbance				
		pos			
		neg			

Use another page for additional test set-up information.

☐ Passed   ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

4.4   Electrostatic discharges (A.7.3.4)

4.4.1   Direct application

	At start	At end	
Application No:	....	Temp:	°C
Type designation:	....	Rel. h:	%
Observer:	....	Date:	yyyy:mm:dd
		Time:	hh:mm:ss

Scale interval d: ....

☐ Contact discharges   ☐ Paint penetration

☐ Air discharges   Polarity[9]: ☐ pos   ☐ neg

Load	Discharges				Result		
	Test Voltage (kV)	Number of discharges ≥ 10	Repetition Interval (s)	Indication I	Significant fault (> d)		
					No	Yes (remarks, test points)	
	without disturbance						
	2						
	4						
	6						
	8 (air discharges)						

☐ Passed   ☐ Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

.

---

[9]   IEC 61000-4-2 specifies that the test shall be conducted with the most sensitive polarity.

4.4 _____ Electrostatic discharges (cont.)

4.4.2 _____ Indirect application (contact discharges only)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Polarity[10]:   [ ] pos   [ ] neg

Horizontal coupling plane

Load	Discharges			Result			
	Test voltage (kV)	Number of discharges ≥ 10	Repetition Interval (s)	Indication I	Significant fault (> d)		
					No	Yes (remarks)	
	without disturbance						
	2						
	4						
	6						

Vertical coupling plane

Load	Discharges			Result			
	Test voltage (kV)	Number of discharges ≥ 10	Repetition Interval (s)	Indication I	Significant fault (> d)		
					No	Yes (remarks)	
	without disturbance						
	2						
	4						
	6						

[ ] Passed   [ ] Failed

Note: If significant faults are detected and acted upon, or if the EUT fails, the test point at which this occurs shall be recorded.

Remarks:

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[10]   IEC 61000-4-2 specifies that the test shall be conducted with the most sensitive polarity.

4.4 _____Electrostatic discharges (cont.)

Specification of test points of EUT (direct application), e.g. by photos or sketches

a)   Direct application

Contact discharges:

Air discharges:

b)   Indirect application

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4.5   **Immunity to electromagnetic fields (A.7.3.5)**

4.5.1   **Immunity to radiated electromagnetic fields (A.7.3.5.1)**

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Rate of sweep: [   ]   Load: [   ]   Material load: [   ]

Disturbances				Result		
Antenna	Frequency range (MHz)	Polarization	Facing EUT	Indication I	No	Significant fault (> d) Yes (remarks)
without disturbance						
		Vertical	Front			
			Right			
			Left			
			Rear			
		Horizontal	Front			
			Right			
			Left			
			Rear			
		Vertical	Front			
			Right			
			Left			
			Rear			
		Horizontal	Front			
			Right			
			Left			
			Rear			

<u>Test severity:</u>

<u>Frequency range:</u>   <u>80 [1] to 2000</u>   <u>MHz</u>
<u>Field strength:</u>   <u>10</u>   <u>V/m</u>
<u>Modulation:</u>   <u>80 % AM, 1 kHz, sine wave</u>

<u>[1] For instruments having no mains or other I/O ports available so that the conducted immunity test according to A.7.3.5.2 cannot be applied, the lower limit of the radiation test is 26 MHz</u>

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

[ ] Passed   [ ] Failed

Remarks:

4.5   Immunity to electromagnetic fields (continued)

4.5.2   Conducted electromagnetic immunity tests (A.7.3.5.2)

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss

Scale interval d: ....

Rate of sweep: [   ]   Load: [   ]   Material load: [   ]

Frequency Range (MHz)	Cable/Interface	Level (Volts RMS)	Result		
			Indication I	Significant fault (> d)	
				No	Yes (remarks)
	without disturbance				
	without disturbance				
	without disturbance				
	without disturbance				
	without disturbance				
	without disturbance				

Test severity:

Frequency range:	0.15 – 80	MHz
RF amplitude (50 ohms):	10	V (e.m.f.)
Modulation:	80 % AM, 1kHz, sine wave	

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

[ ] Passed   [ ] Failed

Remarks:

4.5   **Immunity to electromagnetic fields** **(continued)**

Include a description of the set-up of EUT, e.g. by photos or sketches.

Note: If EUT fails, the frequency and field strength at which this occurs must be recorded.

Radiated:

Conducted:

5   SPAN STABILITY (4.4.3, A.8)

Application No: ....

Type designation: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d)

Automatic zero-setting and zero-tracking device is:

[ ]   Non-existent   [ ]   Not in operation   [ ]   Out of working range

Test load =

Measurement No 1: Initial measurement

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Observer: ....

Location: ....

Conditions of the measurement

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0$ $E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected value[11]
1								
2								
3								
4								
5								

Average error = average ($E_L - E_0$)   [   ]

($E_L - E_0$)$_{max}$ - ($E_L - E_0$)$_{min}$ =   [   ]

0.1 d =   [   ]

If $\left| (E_L - E_0)_{max} - (E_L - E_0)_{min} \right| \leq 0.1$ d, the loading and reading will be sufficient for each of the subsequent measurements.

Remarks:

---

[11] When applicable, necessary corrections resulting from variations of temperature, pressure, etc. See remarks.

5 _____**Span stability (continued)**

Subsequent measurements

For each of the subsequent measurements (at least 7), indicate on the "conditions of the measurement", as appropriate, if the measurement has been performed:

- after the temperature test, the EUT having been stabilized for at least 16 h;

- after the humidity test, the EUT having been stabilized for at least 16 h;

- after the EUT has been disconnected from the mains for at least 8 h and then stabilized for at least 5 h;

- after any change in the test location;

- under any other specific condition.

Measurement No 2:

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Observer: ....

Location: ....

Conditions of the measurement

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected Value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [   ]

Remarks:

5 _____**Span stability (continued)**

Measurement No 3:

	At start	At end	
Observer:	Temp:		°C
	Rel. h:		%
Location:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [____]

Remarks:

Measurement No 4:

	At start	At end	
Observer:	Temp:		°C
	Rel. h:		%
Location:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

|	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected Value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [____]

Remarks:

5 _____**Span stability (continued)**

Measurement No 5:

	At start	At end	
Observer:	Temp:		°C
	Rel. h:		%
Location:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected Value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [   ]

Remarks:

Measurement No 6:

	At start	At end	
Observer:	Temp:		°C
	Rel. h:		%
Location:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [   ]

Remarks:

5 _____**Span stability (continued)**

Measurement No 7:

			At start	At end	
Observer:	....	Temp:			°C
		Rel. h:			%
Location:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [   ]

Remarks:

Measurement No 8:

			At start	At end	
Observer:	....	Temp:			°C
		Rel. h:			%
Location:	....	Date:			yyyy:mm:dd
		Time:			hh:mm:ss

Conditions of the measurement:

$E_0 = I_0 + \frac{1}{2} d - \Delta L_0 - L_0 \qquad E_L = I_L + \frac{1}{2} d - \Delta L - L$

	Indication of zero (I_0)	Add. Load (ΔL_0)	E_0	Indication of load (I_L)	Add. Load (ΔL)	E_L	$E_L - E_0$	Corrected Value
1								
2								
3								
4								
5								

If five loadings and readings have been performed: Average error = average ($E_L - E_0$) [   ]

Remarks:

5   **Span stability (continued)**

Application No: ....Type designation: ....

Plot on the diagram the indication of temperature test (T), damp heat test (D) and disconnections from the mains power supply (P)

Maximum allowable variation:

☐ Passed   ☐ Failed
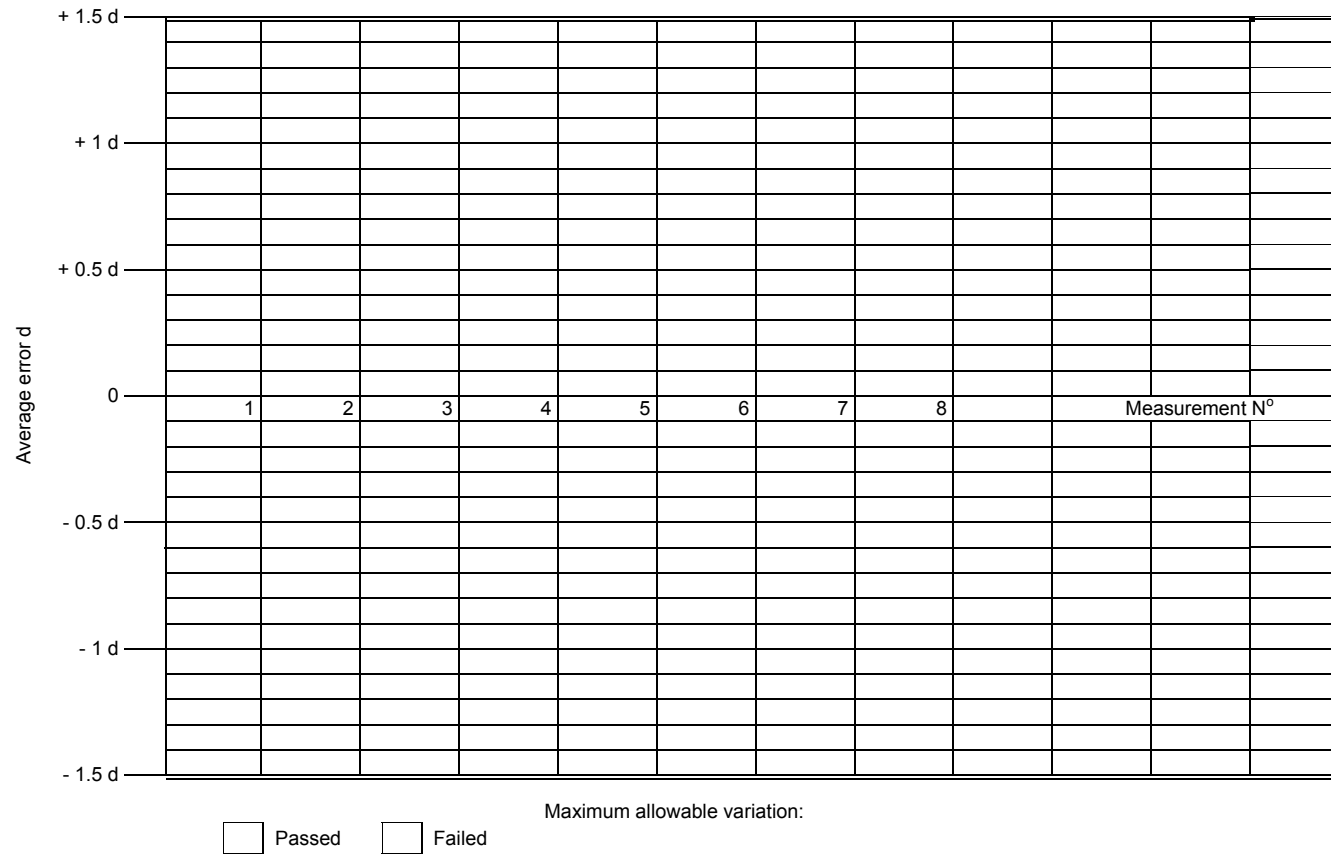
6   Procedure for in-situ tests

6.1   Non-automatic tests of the integral control instrument (3.10, A.5.2)

6.1.2   Accuracy of zero-setting (A.5.2.1.1)

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d):

$E = I + \frac{1}{2} d - \Delta L$
$E = I - L \text{ or } P - L = \text{Error}$

Zero-setting mode	ΔL	$E = \frac{1}{2} d - \Delta L$	MPE

☐ Passed   ☐ Failed

Remarks:

6.1.3 ____ **Determination of weighing performance (6.2, A.5.2.2)**

	At start	At end	
Application No:	Temp:		°C
Type designation:	Rel. h:		%
Observer:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d):

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range   ☐ In operation

Initial zero-setting > 20 % of Max: ☐ Yes   ☐ No

$E = I + \frac{1}{2} d - \Delta L - L$

$E_c = E - E_o$ with E_o = error calculated at or near zero (*)

Load L	Indication I		Add load ΔL		Error E		Corrected error E_c		MPE
	↓	↑	↓	↑	↓	↑	↓	↑	
(*)					(*)				

☐ Passed   ☐ Failed

Remarks:

6.1.4 _____ **Eccentricity tests integral control instrument** (6.2.4, A.5.2.3)

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss

Scale interval d: ....

Resolution during test:
(smaller than d): ....

Load ($^1/_3$ Max) ....

Location of test loads: mark on a sketch (see example below) the successive locations of test loads, using letters which shall be repeated in the table below).

a	b	c
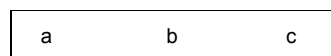
Also indicate on the sketch the location of the display or another perceptible part of the instrument.

Automatic zero-setting device is:

☐ Non-existent   ☐ Not in operation   ☐ Out of working range

$E = I + ½ e - \Delta L - L$
$E_c = E - E_o$ with E_o = error calculated prior to each measurement at or near zero (*)

Load L	Location	Indication I	Add load ΔL	Error	Corrected error E_c	MPE
(*)				(*)		

☐ Passed   ☐ Failed

Remarks:

6.1.5 _____ **Discrimination test (A.5.2.4)**

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss

Scale interval d: ....

Resolution during test:
(smaller than d): ....

Load L	Indication I_1	Remove load ΔL	Add. 1/10 d	Extra load = 1.4 d	Indication I_2	$I_2 - I_1$

☐ Passed ☐ Failed

Remarks:

6.2 **Full-draught weighing of reference wagons – uncoupled, coupled or train (A.9.3.1.1)**

6.2.1 **Coupled wagon static weighing**

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d):

Control instrument is: ☐ Integral ☐ Separate

Coupled wagon static weighing (empty):

Coupled wagon static weighing (loaded):

Wagon	Reference wagon identification	Total wagon mass	Remarks	Reference wagon identification	Total wagon mass	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

Remarks:

6.2   Full-draught weighing of reference wagons – uncoupled, coupled or train (continued)

6.2.2   Uncoupled wagon static weighing

Single uncoupled wagon static weighing:

Wagon	Reference wagon identification	Total wagon mass	Remarks
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
Mean			
Error			
MPE			

Remarks:

6.2.3   Partial weighing of reference wagons (6.1, A.9.3.1.2)

		At start	At end	
Application No:	....	Temp:		°C
Type designation:	....	Rel. h:		%
Observer:	....	Date:		yyyy:mm:dd
		Time:		hh:mm:ss

Scale interval d: ....

Resolution during test: ....
(smaller than d):

Control instrument is: [ ] Integral   [ ] Partial axle weighing

[ ] Separate   [ ] Partial bogie weighing

Partial static weighing (empty):

Wagon	Reference wagon ID	Partial weighing				Total mass ( )	Corrected total (*) ( )	Remarks
		1st partial mass	2nd partial mass	3rd partial mass	4th partial mass			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

(*) Total to be corrected with the rail alignment correction procedure in R106-1, Annex B.
Corrected total = Total mass – rail alignment correction)

6.3   **Partial weighing of reference wagons (continued)**

Partial static weighing (loaded):

Wagon	Reference wagon ID	Partial weighing				Total mass ( )	Corrected total (*) ( )	Remarks
		1st partial mass	2nd partial mass	3rd partial mass	4th partial mass			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

 (*) Total to be corrected with the rail alignment correction procedure in R106-1, Annex B.
Corrected total = Total mass – rail alignment correction)

Remarks:

6.4   Rail alignment correction procedure (A.9.3.1.3, Annex B)

	At start	At end	
Application No:	Temp:		°C
Type designation:	Rel. h:		%
Observer:	Date:		yyyy:mm:dd
	Time:		hh:mm:ss

Accuracy class: A   ....

Maximum capacity: B   ....

Standard weights required: C   ....

(A – 1.5B, rounded down)

Scale interval (d):   ....

Scale interval for stationary load   ....

	Position on load receptor	Indicated mass (t)	
		Empty wagon ( )	Loaded wagon ( )
First axle	Leading end Middle Trailing end		
Second axle	Leading end Middle Trailing end		
Total of six weighings		$D =$	$E =$
Divide total by three			
Derived mass of standard weight		$F = E - D =$	
Alignment correction		$C - F =$	

Note: The use of the capital letters A to F correlate to the table below and the example given in R 106-1, Annex B.

Remarks:

6.5 **In-motion tests (coupled, uncoupled or train) (5.1.3.2, 5.2.2, A.9.3.2)**

	At start	At end	
Temp:			°C
Rel. h:			%
Date:			yyyy:mm:dd
Time:			hh:mm:ss

Application No: ....

Type designation: ....

Observer: ....

Scale interval d: ....

Resolution during test: ....
(smaller than d):

6.5.1 **Summary of test data (5.1.3.2, A.9.3.2)**

Modes of operation tested	
Uncoupled	
Coupled	
Train	
Direction of coupled wagons (single or dual)	

Operating speed	
Maximum operating speed v_{max}	
Minimum operating speed v_{min}	
Site operating speed (Site)	

Coupled wagon and train weighing	
Maximum number of wagons per train n_{max}	
Minimum number of wagons per train n_{mim}	
Total number of wagons coupled	
Number of reference wagons coupled n_{ref}	

	Test run 1 Test speed			Test run 2 Test speed			Test run 3 Test speed			Test run 4 Test speed		
	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site
Percentage of reference wagons within MPE												
Percentage of reference wagons within twice MPE												

	Test run 1 Test speed			Test run 2 Test speed			Test run 3 Test speed			Test run 4 Test speed		
	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site	v_{max}	v_{min}	Site
Sum of reference wagons in train												

6.5.2 **Uncoupled wagon in-motion weighing (6.3.1, 6.4, A.9.3.2.2)**

6.5.2.1 **Test speed near v_{max}: = …………………………..km/h**

Wagons	Reference wagon identification	Reference wagon mass -static ( )	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	
1											
2											
3											
4											
5											
6											
7											
8											
9											
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11											
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6.5.2   Uncoupled wagon in-motion weighing (continued)

6.5.2.2   Test speed near typical site speed: =…………………………………km/h

Wagons	Reference wagon identification	Reference wagon mass -static ()	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass ()	Error	Indicated mass ()	Error	Indicated mass ()	Error	Indicated mass ()	Error	
1											
2											
3											
4											
5											
6											
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8											
9											
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6.5.2 Uncoupled wagon in-motion weighing (continued)

6.5.2.3 Test speed near v_{min}: = …………………………..km/h

Wagons	Reference wagon identification	Reference wagon mass -static ( )	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
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6.5.3 **Coupled wagon or train in-motion weighing** (6.3.2, A.9.3.3)

6.5.3.1 **Test speed near v_{max}: = …………………………..km/h**

Wagons	Reference wagon identification	Reference wagon mass -static ( )	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	
1											
2											
3											
4											
5											
6											
7											
8											
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6.5.3 Coupled wagon or train in-motion weighing (continued)

6.5.3.2 Test speed near typical site speed: = …………………………km/h

Wagons	Reference wagon identification	Reference wagon mass - static ( )	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	Indicated mass ( )	Error	
1											
2											
3											
4											
5											
6											
7											
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6.5.3 Coupled wagon or train weighing (continued)

6.5.3.3 Test speed near v_{min}: = …………………………..km/h

Wagons	Reference wagon identification	Reference wagon mass -static	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
1											
2											
3											
4											
5											
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6.5.4   Continuation report page

Continuation of report page ………………..

Wagons	Reference wagon identification	Reference wagon mass -static	Test run 1		Test run 2		Test run 3		Test run 4		Remarks
			Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	Indicated mass	Error	
31											
32											
33											
34											
35											
36											
37											
38											
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Note: Reproduce this page as necessary for the number of wagon weighings.

7 EXAMINATION OF THE CONSTRUCTION OF THE INSTRUMENT

Use this page to indicate any description or information pertaining to the instrument, additional to that already contained in this report and in the accompanying national type approval or OIML certificate. This may include a picture of the complete instrument, a description of its main components, and any remark which could be useful for authorities responsible for the initial or subsequent verifications of individual instruments built according to the type. It may also include references to the manufacturer description.

Description:

Remarks:

CHECKLIST

The checklist has been developed based on the following principles:

To include requirements that cannot be tested according to test 1 through 6 above, but shall be checked experimentally or visually, e.g. the descriptive markings (3.11);

To include requirements which indicate prohibitions of some functions, e.g. semi-automatic zero-setting devices shall not be operable during automatic operation (3.3.3);

Not to include general requirements, e.g. suitability for use (3.1);

This checklist is intended to serve as a summary of the results of examinations to be performed and not as a procedure. The items on this checklist are provided to recall the requirements specified in R106-1 and they shall not be considered as a substitution for these requirements.

The requirements that are not included in this type evaluation report (test 1 through 6 and checklist 8) are considered to be globally covered by the type approval or OIML certificate (e.g. classification criteria [2.1], suitability for use [3.1]).

For non-mandatory devices, the checklist provides space to indicate whether or not the device exists and, if appropriate, its type. A cross in the box for "present" indicates that the device exists and that it complies with the definition given in the terminology; when indicating that a device is non-existent, also check the boxes to indicate that the tests are not applicable (see p. 5).

If appropriate, the results stated in this checklist may be supplemented by remarks given on additional pages.

8   CHECKLIST (continued)

Application No: ....   Type designation: ....

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
2.3		**Scale interval (d):**			
		For a particular method of weighing-in-motion and combination of load receptors, all mass indicating, recording and printing devices on an instrument shall have the same scale interval.			
		The scale intervals of the indicating, recording and printing devices shall be in the form of 1×10^k, 2×10^k, or 5×10^k, "k" being a positive or negative whole number or zero.			
2.4		**Scale interval for stationary load:**			
		If the scale interval for stationary load is not equal to d then automatically put out of service when instrument used for weighing-in-motion			
		Shall not be readily accessible and shall only be used for static testing if instrument not verified for use as a non-automatic weighing instrument			
2.8		**Units of measurement:** • kilogram (kg); • tonne (t).			
3.2	A.1.3	**Security of operation**			
		Fraudulent use:			
		The instrument has no characteristics likely to facilitate its fraudulent use			
3.2.1		**Accidental maladjustment:**			
		Effect of accidental breakdown or maladjustment is evident			
3.2.2		**Interlocks:**			
		Interlocks shall prevent or indicate the operation of the instrument outside the specified working conditions. Interlocks provided for:			
		• minimum operating voltage (2.7.2)			
		• vehicle recognition (3.7)			
		• wheel position on the load receptor (3.8)			
		• range of operating speeds (3.4.5.3)			
		Prevent use of any control device that may alter a weighing operation			
3.2.4		**Uncoupled wagon weighing the instrument recognise and prevent the passage of:**			
		• 2 or more uncoupled wagons			
		• 2 or more uncoupled wagons so close as to cause either malfunction or errors exceeding the MPE.			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3 2.5		**Automatic operation:**			←
		Instrument provides a level of confidence "near to certainty" that the operation of the instrument for a specified period is within the requirements of this Recommendation. Documentation submitted that includes a description of how this condition is met.			
		The level of confidence shall take account of uncertainties of measurement, significant faults, overload situation, high speed and failure of the instrument.			
3 2.6		**Use as a non-automatic weighing instrument:**			
		comply with the requirements of OIML R76-1 for class ⬙ or class ⬙ non-automatic weighing instruments;			
		Equipped with enabling device for non-automatic operation that prevents automatic operation and in-motion weighing			
3 3	**A.5.1**	**Zero-setting device:**	Present		Not-Present
		Initial zero-setting	[ ]		[ ]
		Automatic zero-setting	[ ]		[ ]
		Semi-automatic zero-setting	[ ]		[ ]
		Non-automatic zero-setting	[ ]		[ ]
		Zero-tracking	[ ]		[ ]
		A semi-automatic zero-setting device shall not be operable during automatic operation.			←
3 3.1	A.5.1.2	**Accuracy of zero-setting:**			
		Zero is maintained to not more than $\pm$ 0.25 d			
		Effect of zero-setting:			
		Zero-setting range = %			
		Initial zero-setting range = %			
3 3.2		**Automatic zero-setting:**			
		• Operates sufficiently often to maintain zero within 0.5 d;			←
		• When operating as part of every weighing cycle, it is not possible to disable or set at time intervals;			←
		• Maximum programmable time interval value is specified by manufacturer;			←
		• Capable of automatic zero-setting after allocated time;			←
		• Stopping the instrument so that zero-setting can occur;			←
		• Generates information to overdue zero-setting.			←
3 3.5		**Zero-tracking operates only:**			
		• when indication is at zero; or, at			
		• negative net zero value equivalent to gross zero ;			
		• Stability criteria is fulfilled for static weighing; and			
		• Corrections are not more than 0.5 d per second.			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.4	A.1.3	**Recording, indicating and printing**			
3.4.1		**Quality of indication:**			
		Reading of the primary indications shall be reliable, easy and unambiguous under conditions of normal use:			
		• the overall inaccuracy of reading of an analogue indicating device shall not exceed 0.2 d,			
		• the figures, units and designations forming the primary indications shall be of a size, shape and clarity for reading to be easy.			
		The indication shall be the self-indicating type and the scales, numbering and printing shall permit the figures which form the results to be read by simple juxtaposition			
3.4.2		**Printing device:**			
		Printing shall be clear and permanent for the intended use. Printed figures shall be at least 2 mm high.			
		If printing takes place, the name or the symbol of the unit of measurement shall be either to the right of the value or above a column of values, or placed in accordance with national regulation.			
3.4.3		**Indicating and recording for normal operation:**			
		The minimum indication and recording resulting from each normal weighing operation shall be dependent upon the application of the instrument, and shall include the date and the time, the operating speed, and in the case of wagon weighing each wagon mass and in the case of train weighing each wagon mass and the train mass.			
		For normal operation the scale interval of indications and recordings for the individual wagon mass or the train mass shall be the scale interval d in accordance with 2.3.			
		The scale interval of indications and recordings of measured or calculated mass values, may be to a higher resolution than the scale interval d.			
		The results shall bear the name or symbol of the appropriate unit of mass in accordance with 2.8.			
3.4.4		**Digital indication:**			
		Where the scale interval is changed automatically the decimal sign shall maintain its position in the display.			
		A decimal fraction shall be separated from its integer by a decimal sign (comma or dot), with the indication showing at least one figure to the left of the sign and all figures to the right.			
		The decimal sign shall be on one line with the bottom of the figures (example: 0.705 kg).			
		A digital zero indication shall include the display of a zero for all places that are displayed to the right of a decimal point and at least one place to the left. When no decimal values are displayed, a zero shall be displayed for each place of the displayed division, (i.e. at least one active decade plus any fixed zeros must be displayed).			
3.4.5		**Limits of indication or recording of weighing results:**			
3.4.5.1		**Weighing capacity:**			
		• the mass of the locomotive;			
		• mass values above Max + 9 d.			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.4.5		**Limits of indication or recording of weighing results:**			
3.4.5.2		**Single axle or bogie load:**			
		Single axle or bogie load shall not be indicated or recorded without an associated warning that these weighing results cannot be verified.			
3.4.5.3		**Operating speed:**			
		Instruments shall not indicate or record the mass of any wagon that has travelled over the load receptor at a speed outside the range of operating speeds.			
3.4.5.4		**Roll back:**			
		The indicated or recorded values of wagon mass shall not be altered due to any part of any wagon travelling over the load receptor more than once, unless the wagon is been reweighed.			
3.5		**Totalising device:**	Present [ ]	Not-Present [ ]	
		Automatic			
		Semi-automatic			
3.6		**Recorded data storage:**	Present [ ]	Not-Present [ ]	
		Memory of the instrument (hard drive),	Present [ ]	Not-Present [ ]	
		Universal computer storage	Present [ ]	Not-Present [ ]	
		Removable external storage	Present [ ]	Not-Present [ ]	
		In all cases, the stored data shall be adequately protected against intentional and unintentional changes during the transfer process and stored data shall contain all relevant information necessary to reconstruct an earlier measurement.			
		Means of securing data storage:			
		a) Software transmission and downloading process shall be secured in accordance with the requirements in 3.13;			
		b) External storage devices identification and security attributes shall be verified to ensure integrity and authenticity;			
		c) Exchangeable storage media is sealed against removing in accordance with 3.14			
		d) Device-specific parameters are not stored on the standard storages of the universal computer but in separate hardware that can be sealed in accordance with 3.14;			
		e) When storage capacity is exhausted, new data shall replace oldest data.			
		National regulation may specify other requirements for securing stored data which provide sufficient integrity.			

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Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.7		**Vehicle recognition device:** The device shall detect the presence of a wagon in the weigh zone and shall detect when the whole wagon has been weighed.			
3.8		**Vehicle guide device:**			
		An instrument equipped with a vehicle guide device shall not indicate or record the wagon mass if any part of the wagon did not pass fully over the load receptor.			
		If only one direction of travel is specified for an instrument, an error message shall be given or the instrument shall not indicate or record the wagon mass if it travels in the wrong direction.			
3.10		**Integral control instrument**			
3.10.1		Full-draught weighing	Present [ ]	Not-Present [ ]	
		Meets the requirements of 3.10.1.1 to 3.10.1.4 inclusive and 6.1			
		Bogie partial weighing	Present [ ]	Not-Present [ ]	
		Meets the requirements of 3.10.2.1 to 3.10.2.4 inclusive and 6.1			
		Partial weighing of two-axle wagons	Present [ ]	Not-Present [ ]	
		– the alignment correction or exemption test for partial weighing instruments in Annex B has been successfully applied.			
		– it ensures the determination of the conventional true value of the static two-axle reference wagon mass to an error of at most one-third of the maximum permissible error for weighing-in-motion specified in 2.2.1			
3.12		**Installation**			
3.12.1		**General**			
		Weigh-in-motion instruments shall be manufactured and installed so as to minimise any adverse effects of the installation environment.			
		The space between the load receptor and ground shall allow all covered parts of the load receptor to be kept free from all debris or other matter that could affect the accuracy of the instrument.			
		Where particular details of installation have an effect on the weighing test operation (e.g. site levels, length of aprons), these details shall be recorded in the test report.			
3.12.2		**Composition:**			
		Instruments shall include the following:			
		One or more load receptors	Present [ ]	Not-Present [ ]	
		Aprons	[ ]	[ ]	
		Vehicle-type identification devices	[ ]	[ ]	
		Indicating, recording or printing device;	[ ]	[ ]	
		Control unit	[ ]	[ ]	

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Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.12.3		**Ease of static testing:** Accessible to vehicles moving test weight if used as a control instrument			
3.12.4		**Drainage** If the weighing mechanism is contained in a pit, there shall be a provision for drainage to ensure that no portion of the instrument becomes submerged or partially submerged in water or any other liquid.			
3.12.5		**Heating** If the weighing mechanism is installed in environment where temperatures below the minimum specified temperature can be expected, there shall be provision for heating to ensure that the instrument operates correctly within the requirements in this Recommendation.			
3.13	A.2.4	**Software**			
		The legally relevant software used in an instrument must be present in such a form in the instrument that alteration of the software is not possible without breaking a seal, or any change in the software can be signalled automatically by means of an identification code.			
		National regulation may specify other requirements for securing software which provide sufficient integrity.			
		The software documentation provided by the manufacturer shall include:			
		a) A description of the legally relevant software;			
		b) A description of the accuracy of the measuring algorithms (e.g. programming modes);			
		c) A description of the user interface, menus and dialogues;			
		d) The unambiguous software identification;			
		e) An overview of the system hardware, e.g. topology block diagram, type of computer(s), source code for software functions, etc, if not described in the operating manual;			
		f) Means of securing software;			
		g) The operating manual.			
		The following means of securing legally relevant software apply:			
		a) Access shall only be allowed to authorised people, e.g. by means of a code (key-word) or of a special device (hard key, etc); the code must be changeable;			
		b) It shall be possible for at least the last intervention to be memorised and it must be possible to access and display this information; the record shall include at least the ten most recent access or changes, the date and a means of identifying the authorised person making the intervention; the traceability of the last intervention shall be assured for at least two years, if it is not over-written on the occasion of a further intervention; if it is possible to memorise more than one intervention, and if deletion of a previous intervention must occur to permit a new record, the oldest record shall be deleted.			

Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
		c) Downloading of legally relevant software shall be through appropriate protective interface (T.2.8) connected to the instrument;			
		d) The software shall be assigned with appropriate software identification (T.2.5.6.4). This software identification shall be adapted in the case of every software change that may affect the functions and accuracy of the instrument.			
		e) Functions that are performed or initiated via a software interface shall meet the relevant requirements and conditions for interfaces of 4.3.5.			
3.14		**Securing of components, interfaces and pre-set controls**			
3.14.1		**General:**			
		Components, interfaces, software devices and pre-set controls that are not intended to be adjusted or removed by the user shall be:			
		Fitted with a securing means, or			
		Enclosed.			
		If enclosed, the enclosure is sealed			
		National prescribed types of securing are permitted which provide sufficient integrity.			
		Seals are easily accessible			
		Any device for changing the parameters of legally relevant measurement results, particularly for correction and calibration, shall be sealed in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an instrument.			
		Securing provided on all parts of the measuring system which cannot be materially protected in any other way against operations liable to affect the measurement accuracy			
3.14.2		**Means of securing:**			
		a) Access shall only be allowed to authorised people, e.g. by means of a code (key-word) or of a special device (hard key, etc); the code must be changeable;			
		b) It shall be possible for at least the last intervention to be memorised and it must be possible to access and display this information; the record shall include at least the ten most recent access or changes, the date and a means of identifying the authorised person making the intervention; the traceability of the last intervention shall be assured for at least two years, if it is not over-written on the occasion of a further intervention; if it is possible to memorise more than one intervention, and if deletion of a previous intervention must occur to permit a new record, the oldest record shall be deleted.			
		c) Software functions shall be secured against intentional, unintentional and accidental changes in accordance with the requirements of 3.6;			

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Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
		d) Transmission of legally relevant data via interfaces shall be secured against intentional, unintentional and accidental changes in accordance with the requirements of 4.3.5.2;			
		e) The securing possibilities available in a taximeter shall be such that separate securing of the settings is possible;			
		f) Stored data shall be secured against intentional, unintentional and accidental changes in accordance with the requirements of 3.6.			
3.15	A.2.3	**Descriptive markings**			
3.15.1		**Markings shown in full:**			
		• Identification mark of the manufacturer			
		• Identification mark of the importer (if applicable)			
		• Serial number of the instrument and modules (including each load receptor, if applicable)			
		• Maximum wagon mass ....kg or t			
		• Minimum wagon mass .... kg or t			
		• Not to be used to weigh liquid products (if applicable)			
		• Full draught or number of partial weighings per wagon			
		• maximum transit speed ....km/h			
		• Direction of weighing (if applicable)			
		• scale interval for stationary load (if applicable) .....kg or t			
		• voltage supply V			
		• power supply frequency ....Hz			
		• Temperature range (when not -10°C to 40°C)			
3.15.2.1		**Markings shown in code:**			
		• type approval sign in accordance with national requirements			
		• accuracy class wagon mass (each weighing method, if applicable) 0.2, 0.5, 1 or 2			
		• maximum capacity; Max = ... kg or t			
		• minimum capacity; Min = ... kg or t			
		• scale interval; d = ... kg or t			
		• maximum operating speed; v_{max} = ... km/h			
		• minimum operating speed; v_{min} = ... km/h			
3.15.2.2		**Train weighing**			
		• Maximum number of wagons per train; n_{max} = ...			
		• Minimum number of wagons per train; n_{min} = ...			

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Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
3.15.3		**Supplementary markings:**			
		Are required			
3.15.4		**Other markings:**			
		The designation of the liquid(s) which the instrument is designed to weigh (if applicable).			
3.15.5		**Presentation of descriptive markings:**			
		Indelible			
		Size, shape and clarity that allows easy reading			
		Grouped together in a clearly visible place			
		Plate bearing markings to be sealed, unless it cannot be removed without being destroyed			
		Shown on a programmable display bearing: • At least Max, Min and d shall be displayed as long as the instrument is switched on. • The other marking may be shown on manual commend. • It must be described in the type approval (OIML) certificate			
		For programmable display, means shall be provided for any access to reprogramming of the markings to be automatically and non-erasably recorded and made evident by an audit trail			
		When a programmable display is used, the plate of the instrument shall bear at least the following markings:			
		• type and designation of the instrument, • name or identification mark of the manufacturer, • type approval number, • electrical supply voltage, • electrical supply frequency, • pneumatic/hydraulic pressure, (if applicable).			
3.16	A.2.4	**Verification marks**			
3.16.1		**Position:**			
		Part where verification marks are located cannot be removed from the instrument without damaging the marks			
		Allows easy application of marks without changing the metrological qualities of the instrument			
		Visible when the instrument is in service			
3.16.2		**Mounting:**			
		Verification mark support (e.g. stamp with malleable qualities) inserted into a plate fixed to the instrument or a cavity bored into the instrument to ensure conservation of the marks			
		Verification mark support is durable for the intended use of the instrument and of the correct construction			

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Requirement (R 106-1)	Test procedure	Automatic rail-weighbridges	Passed	Failed	Remarks
4.3	A.1.4	**Functional requirements**			
4.3.1		**Acting upon a significant fault:**			
		By verifying the compliance with documents or by simulating faults check that :			
		Either the instrument is made inoperative automatically, or			
		A visual or audible indication is provided automatically and continues until the user takes action or the fault disappears			
4.3.2	A.6.1	**Upon switch-on:**			
		Relevant signs of indicator are active and non-active for sufficient time to be checked by operator			
4.3.4	A.6.1	**Warm-up time:**			
		No indication or transmission of weighing results			
		Automatic operation is inhibited			
		Interfaces:			
		When an interface is used:			
		Instrument shall continue to function correctly and its metrological functions shall not be influenced.			
4.3.5.1		**Interface documentation:**			
		The manufacturer shall provide documentation on all interfaces comprising of at least:			
		a) A list of all commands (e.g. menu items);			
		b) Description of the software interface;			
		c) A list of all commands together;			
		d) A brief description of their meaning and their effect on the functions and data of the instrument.			
4.3.5.2		**Securing of interfaces:**			
		Interfaces shall not allow the legally relevant software and functions of the instrument and its and measurement data to be inadmissibly influenced by other interconnected instruments, or by disturbances acting on the interface.			
		Interfaces for legally relevant software and functions shall be secured as follows:			
		a) Data is protected (e.g. with a protective interface) against accidental or deliberate interference during the transfer;			
		b) All functions in the software interface shall be subject to the requirements for securing software in 3.13;			
		c) All functions in the hardware interface shall be subject to the requirements for securing hardware in 3.14;			
		d) Metrologically relevant parts of the target instrument shall be included in the initial verification (or equivalent conformity assessment procedures);			

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		c) it shall be easily possible to verify the authenticity and integrity of data transmitted to and from the instrument;			
		d) Functions performed or initiated by other connected instruments through the interfaces shall meet the appropriate requirements of this OIML Recommendation.			
		Other instruments required by national regulation to be connected to the interfaces of an instrument shall be secured to inhibit automatically the operation of the instrument for reasons of the non-presence or improper functioning of the required device.			
4.3.6		**AC mains power:**			
		Maintains information for 24 hours after power failure			
		Emergency switch-over does not cause significant fault			
4.3.7		**DC mains power or auxiliary rechargeable battery**			
		When below manufacturer's specified value			
		Continues to function correctly, or			
		Is automatically put out of service			
5.1.1	A.1.1	**Documentation**			
		Documentation includes:			
		Metrological characteristics of the instrument			
		A standard set of specifications for the instrument			
		A functional description of the components and devices			
		Drawings, diagrams and general software information (if applicable), explaining the construction and operation, and			
		Any document or other evidence that the design and construction of the instrument complies with the requirements of the recommendation			
5.1.3		**Examination of:**			
		Documents			
		Functional checks			
		Test reports from other authorities			

Use this space to detail remarks from the checklist